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The Illinois Institute for Rural Affairs (IIRA) works to improve the quality of life for rural residents by partnering with public and private agencies on local development and enhancement efforts.



**Western Illinois
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Hospitals in Illinois that are Likely to Seek the Rural Emergency Hospital Designation: An Exploratory Analysis

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Adee Athiyaman¹

Abstract

The Rural Emergency Hospital designation offers current Critical Access Hospitals and rural Prospective Payment System hospitals with fewer than 50 beds to furnish emergency department and observation services. A principal component analysis of microdata from the CMS suggests that there are 13 potential REH members in Illinois, 10 in the nonmetro and three in the metro.

Introduction

Section 125 of the Consolidated Appropriations Act of 2021 created a new Medicare provider segment, the Rural Emergency Hospital (REH) segment². The designation effective as of January 1, 2023, offers current Critical Access Hospitals and rural Prospective Payment System hospitals with fewer than 50 beds to furnish emergency department and observation services³ (Table 1); REHs will be paid by Medicare at a rate higher than the applicable payment based on the Medicare Outpatient Prospective Payment System⁴.

¹ Professor, Illinois Institute for Rural Affairs, Western Illinois University.

² Rural emergency hospitals proposed rulemaking, July 15, 2022; see <https://www.cms.gov/newsroom/fact-sheets/rural-emergency-hospitals-proposed-rulemaking>.

³ See, www.congress.gov/116/bills/hr133/BILLS-116hr133enr.pdf.

⁴ See <https://www.cms.gov/newsroom/fact-sheets/cy-2023-medicare-hospital-outpatient-prospective-payment-system-and-ambulatory-surgical-center-1>.

The REH could be an attractive business model for rural hospitals experiencing financial challenges; according to a report from the Center for Healthcare Quality and Payment Reform, about 631 rural hospitals in the nation are at risk of closure due to inadequate revenues, 13 of these are in Illinois⁵. However, industry publications suggest that REH requirements such as

providing little or no inpatient services are viewed as unattractive by hospital administrators⁶; most of the rural hospitals are embedded in their communities and hence reluctant to divest themselves of unprofitable products.

Table 1: REH Requirements, Salient Attributes³

No provision of acute care inpatient services
 Average per patient stay not to exceed 24 hours
 Have a transfer agreement in place with a level 1 or 2 trauma center
 Maintain a staffed emergency department, 24 x 7
 Meet Critical Access Hospital equivalent conditions of participation for emergency services.
 Develop an implementation plan for conversion to REH status
 Meet quality standards

In a recent paper, Pink et al (2021)⁸ listed 68 rural hospitals in the nation as potential REH members; their statistical model had three predictor variables: long-term unprofitability, average acute and swing daily census less than three⁹, and net patient revenue less than \$20million. Although Pink et al used a combination of expert opinions and surveys to decide on predictors, I believe that a model built on concepts from organizational change theories

would better predict REH membership; this approach is used in this paper.

Theory and Hypotheses

Let $H(x)$ be a hospital with production attributes $a(x)$ which are a subset of production attributes A found in the entire population of hospitals, $() \subseteq$. In organizational theory, the distribution of firms, hospitals in our case, over all attributes A is called the social

⁵ <https://www.beckershospitalreview.com/finance/631-rural-hospitals-at-risk-of-closure-by-state.html>.

⁶ Rural Hospitals Plan to Reject Congress' Program. Politico, 10/27/2022. Available <https://www.politico.com/newsletters/politico-pulse/2022/10/27/rural-hospitals-plan-to-reject-congress-program-00063670>.

⁷ See, National Rural Health Association: REH Model Summary. Available:

<https://www.ruralhealth.us/news/nrha-magazines>.

⁸ Pink GH, Thompson KW, Howard HA, Holmes GM. *How Many Hospitals Might Convert to a Rural Emergency Hospital (REH)?* NC Rural Health Research Program, UNC Sheps Center. July 2021.

⁹ It is a change-in-status metric; an inpatient could "swing" from acute care to post-acute nursing services.

production space¹⁰. If more hospitals possess a similar set of attributes as those of hospital $H(x)$, then the survival chance of the hospital will be lower. Thus:

H_1 : The higher the differentiation of a hospital within the social production space, the higher is its survival chances.

Movements within the social production space, improvements in market position, depend on how quickly and effectively the organization, $H(x)$, can scan and evaluate environmental signals. This capability is reduced for organizations that function in high population areas¹¹; specifically, high population density increases uncertainty in determining the correlates of market position. Accordingly:

H_2 : A firm's ability to improve its market position is negatively related to the population density of its market area.

In strategy research, firm size is often used as a predictor of structural inertia¹²; for example, a larger hospital will find it difficult to change its service mix than a smaller facility¹³. For REH, a smaller hospital may easily shift the emphasis from inpatient to emergency services. In summary:

H_3 : Smaller hospitals have more ability to adapt their position in the marketplace than do larger ones.

Beyond the influence of firm size on organizational inertia, strategy research implies that the scope of operations facilitates or deters firms' adaptive movements within the social production space¹⁴. For example, generalist firms with large operations have greater flexibility in deciding which products to add or divest. In contrast, specialist firms with niche operations such as drug rehabilitation services may find it difficult to retool its product mix. Hence:

H_4 : Specialist hospitals will have less ability to reposition themselves than generalists.

Finally, age of the hospital and type of ownership are hypothesized to affect a hospital's marketplace adaptability. Young organizations lack well-defined routines and roles; they are less rigid and can easily adapt to change. Similarly, for-profit hospitals, labeled 'utilitarian' in organizational theory, are more likely to adapt to the requirements of market environment than 'purposive organizations'¹⁵. Since data on age of

¹⁰ See, for example, Hannan, M., and Freeman, J. (1989). *Organizational Ecology*. Cambridge, MA: Harvard University Press.

¹¹ MacArthur, R. (1972). *Geographical Ecology: Patterns in the Distribution of a Species*. Princeton, NJ: Princeton University Press.

¹² Same reference as Footnote 10.

¹³ Feldstein, P. (1988). *Health Care Economics*. New York: Wiley.

¹⁴ Levitt, B., and March, J. (1988). Organizational learning. *Annual Review of Sociology*, 14, 319-340.

¹⁵ The labels, utilitarian and purposive for organizations, were coined by Clark, P. and Wilson, J. (1961). Incentive systems: a theory of organizations. *Administrative Science Quarterly*, 6, 129-166.

hospitals have questionable validity¹⁶, our empirical analysis is confined to the “for-profit” status of the hospitals; thus:

H₅: For-profit hospitals suffer less structural inertia than their nonprofit counterparts.

Methodology

The criterion, market adjustment, variously labeled ‘market position’, ‘structural inertia’ and ‘differentiation’, is concerned with change. In other words, questions of market adjustment require answers of longitudinal variety, for example, changes in market position of $H(x)$ over a period of time.

Longitudinal data on healthcare services were sourced from the CMS’ “provider of services file”¹⁷ and “hospital provider cost report”¹⁸; critical access hospitals in Illinois were the unit of analysis. Data on market adjustment and its covariates were sourced for two time periods¹⁹. Table 2 lists the variables used in data analysis.

¹⁶ Changes in ownership status prevent us from gathering valid data on the age of hospitals; see the variable “CHOW_CNT” in Table 2.

¹⁷ <https://data.cms.gov/search?keywords=Provider%20of%20Services%20File%20-%20Hospital%20%26%20Non-Hospital%20Facilities&sort=Relevancy>.

¹⁸ <https://data.cms.gov/search?keywords=Hospital%20Provider%20Cost%20Report&sort=Relevancy>.

¹⁹ Q4 2022 and Q4 2015 for the “provider of services” data; 2015 and 2019 for the “cost reports”.

Table 2: Variables and their Definitions²⁰

Variable Label	Definition	Source
STATE_CD	US State; Illinois = 17	Provider of services datafiles, Q4, 2022 and Q4, 2015.
PRVDR_CTGRY_SBTYP_CD	Provider category; 11 = critical access hospital	
FAC_NAME	Name of the provider	
ZIP_CD	Five-digit ZIP code for a provider's physical address.	
FIPS_CNTY_CD	FIPS county code	
CBSA_URBN_RRL_IND	Core Based Statistical Area, rural-urban classification	
GNRL_CNTL_TYPE_CD	Ownership of the provider; for example, 04 = private, for profit	
*SRVC_CD	Services; see footnote 20.	
BED_CNT	Total number of hospital beds	
SB_SIZE_CD	Size of the hospital providing swing bed services	
CAH_SB_SW	Number of cardiac catheterization procedure rooms	
CHOW_CNT	Change of ownership, number of times	
GNRL_FAC_TYPE_CD	Termination status of the provider	
EMPLOYEES	FTE employees	
REVENUE	Gross revenue	
COST_TO_CHARGE	Ratio	

Note: See footnotes 17-20 for more information about variables and data.

A hospital's 'market adjustment' was computed as a change score, the difference between number of services offered by the hospital in 2022 and 2015. The domain of the construct,

"REH membership", deals with a hospital's ability to change its market position. This ability is a function of the hospital's market area characteristics (population density), size of the hospital,

²⁰ The table doesn't list service variables; in all, there were 73 service variables. For example, the variable label ACUTE_RNL_DLYS_SRVC_CD measures the service, "acute renal dialysis".

specialization ratio, and the hospital's for-profit status; these measures produce the construct. This formative specification implies the relationship: $\eta = x_1 + x_2 + x_3 + x_4$, where η represents the construct and x denotes measures, for example, population density.

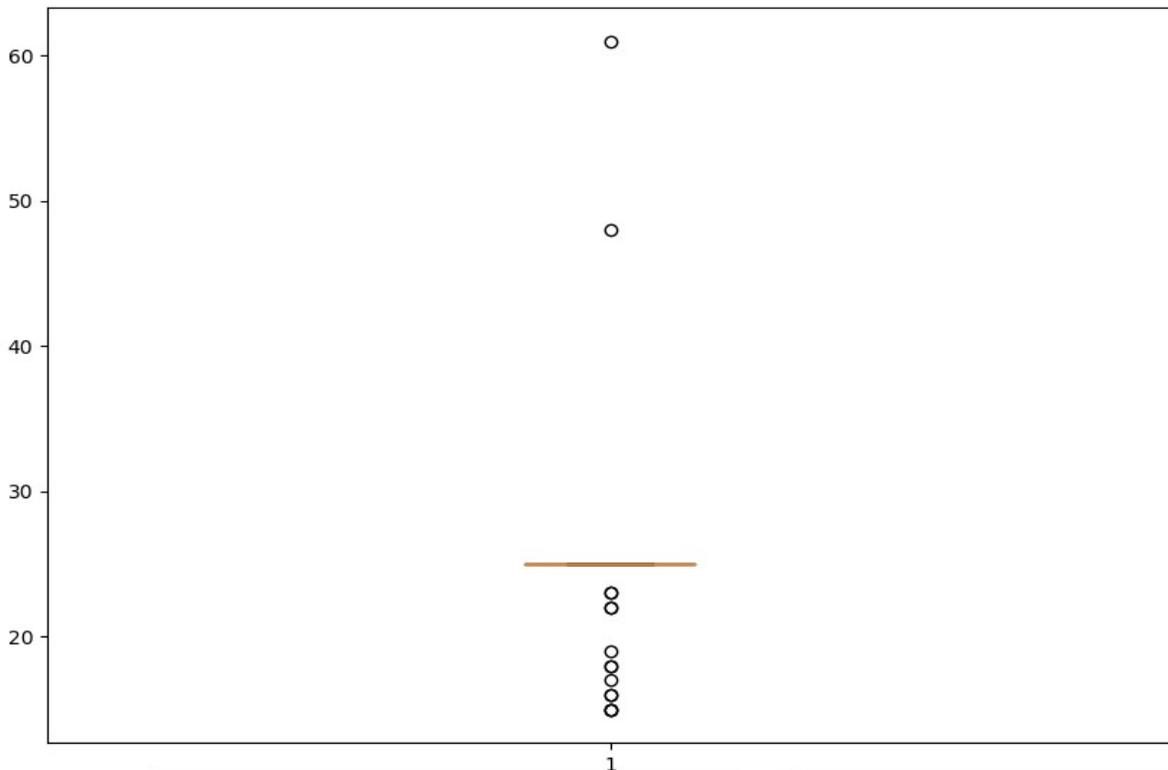
Since the linear model is a principal components (PC) model, we construct PC scores and establish the nomological validity of the construct (REH membership) by correlating PC scores with their consequences (see

Appendix 2). Finally, hypotheses were tested using group comparison procedures, crosstabulations, and correlational procedures.

Findings

The two data files were merged using the hospital provider identification number, CMS certification number or CCN²¹. Of the 52 critical access hospitals in the state²², a majority were located in the nonmetro (76%) and had an average of 25 beds each (Figure 1).

Figure 1: Number of Hospital Beds, Box Plot of Variable BED_CNT, See Table 2



Note: The outliers were: (i) Memorial Hospital, Randolph County, with 61 beds and Memorial Hospital Association, Hancock County, with 48 beds.

²¹ See Table 2.

²² Provider of Services data, Q4, 2022, lists 53 critical access hospitals, but labels “Cornerstone

Healthcare of Illinois”, White County, as a “voluntary-merger, closure” hospital; See variable PGM_TRMNTN_CD.

Market Adjustment

Business strategy is based on the concepts of competitive and comparative advantages²³; Figure 2 is grid representation of these concepts. In general, hospitals possess location-specific advantages; for example, a

captive market, the local population has to rely on one or more “local” hospitals for healthcare services. The normative prescription to compete in such a market is to alter operations, for example, offer more services, change the service mix.

Figure 2: Competitive and Comparative Advantage and Generic Strategies

		Comparative Advantage	
		No Advantage	Advantage
Competitive Advantage	No Advantage	Pure competition	Alter operations
	Advantage	Intra-industry trade	Innovate

Figure 3 shows the extent to which changes in services have contributed to gross revenue. The rank correlation between the variables is positive, $r=0.27$, $p<0.05$, which implies that location-specific comparative

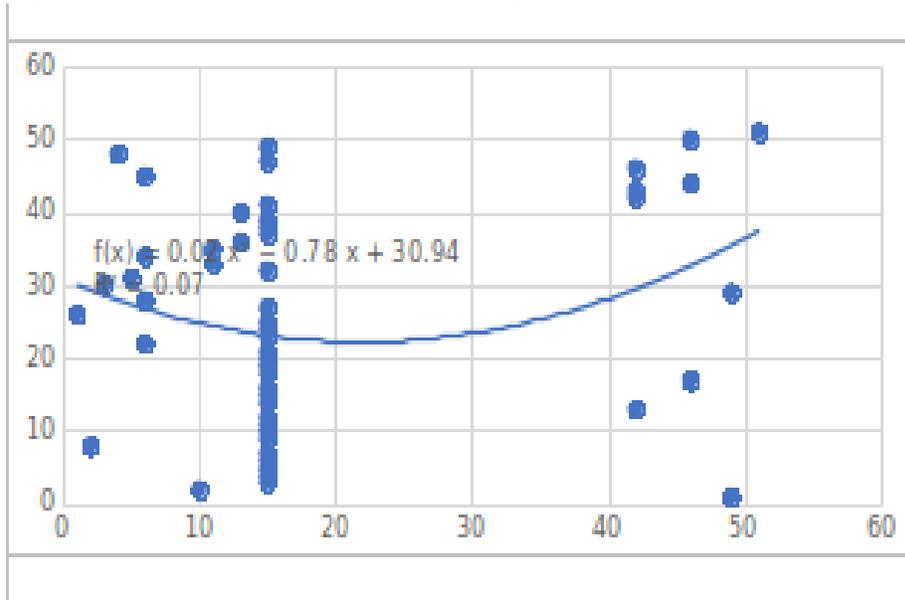
advantages are attained by altering operations. In summary, the hypothesis that differentiation in service mix increases a hospital’s survival chances (H_1) is supported by the analysis²⁴.

²³ Comparative advantages are situation-specific advantages that competitors can replicate at reasonable cost, for example, by relocating or altering the situational circumstances; in contrast, competitive advantages are firm-specific advantages that cannot be imitated by

other firms. See, Athiyaman, A. (2023). *Mathematical Models for Community Economic Development*. Macomb, IL: IIRA.

²⁴ See the arguments in the methodology section for equating differentiation with changes in service offerings.

Figure 3: Correlation between Changes in Service Mix and Revenue



Indicators of REH Membership

The descriptive statistics of the indicator variables H_2 to H_5 and the results of the principal component analysis are shown in Table 3. The first principal component (Prin1) accounts for 52% of the total variance in the data set; the weights are:

$$\begin{aligned} \text{Prin 1} = & .97 \times \text{Pop. Density} - .25 \times \text{Firm Size} \\ & + .00014 \times \text{Specialist} + .0004 \times \text{Utilitarian} \end{aligned}$$

Table 3: Model of REH Membership, Principal Component Analysis

Descriptive Statistics

Variable	Mean	Std. Deviation
Population Density ²⁵	66.82	84.90
Size of the Hospital ²⁶	176.75	82.11
Specialist ²⁷	.35	.06
Utilitarian ²⁸	.63	.59

Covariance Matrix²⁹

	Population Density	Size	Specialist	Utilitarian
Population Density	7209.615749	-129.6134461	1.470536	1.965961
Size	-129.613446	6742.873781	1.744592	-0.975035
Specialist	1.470536	1.744592	0.004834	0.000623
Utilitarian	1.965961	-0.975035	0.000623	0.358431

Eigenvalues of the Covariance Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	7243.19434	533.89771	0.5191	0.5191
2	6709.29663	6708.93886	0.4809	1
3	0.35776	0.3537	0	1
4	0.00407		0	1

Component scores for the hospitals suggest that there are 13 potential REH members, 10 in the nonmetro and three in the metro (Table 4). Appendix 2 highlights the construct validity of the

construct “REH membership” by exploring known group differences between high potential REH hospitals and low potential ones.

²⁵ Sourced at the county level from the 2020 Area Health Resources File, variable label: F13876-20.

²⁶ FTE employees, see Table 2.

²⁷ \sum *SRVC_CD variables / 73; see Table 2.

²⁸ GNRL_CNTL_TYPE_CD was recoded as follows: 1 = Private, not-for profit; 2 = Private, for profit, and 0 = others.

²⁹ The indicators were not standardized; the indicators are not equally important for the formation of the construct.

Table 4: Potential REH Members

Hospital	Location, County	Urban-Rural Indicator
WARNER HOSPITAL AND HEALTH SERVICES	De Witt	Rural
WASHINGTON COUNTY HOSPITAL	Washington	Rural
MIDWEST MEDICAL CENTER	Jo Daviess	Rural
GENESIS MEDICAL CENTER - ALEDO	Mercer	Urban
SAINT JOSEPH MEMORIAL	Jackson	Urban
SARAH D CULBERTSON	Schuyler	Rural
MASSAC MEMORIAL HOSPITAL	Massac	Rural
UNION COUNTY HOSPITAL DISTRICT	Union	Rural
MORRISON COMMUNITY HOSPITAL	Whiteside	Rural
HARDIN COUNTY GENERAL HOSPITAL	Hardin	Rural
PARIS COMMUNITY HOSPITAL	Edgar	Rural
COMMUNITY HOSPITAL OF STAUNTON	Macoupin	Urban
CLAY COUNTY HOSPITAL	Clay	Rural

Correlates of Marketplace Adaption³⁰

Contrary to the expectation, size of the hospital is positively associated with marketplace adaption, $r=.37$, $t=2.83$, $p<.05$. Similarly, hospitals operating in

densely populated areas have improved their market position by increasing their service mix, $r=.25$, $t=1.8$, $p<.05$. In summary, both H_2 and H_3 were disconfirmed; further research is needed to explore these deviations.

Summary and Conclusion

This paper models the potential of REH membership among 52 Illinois critical access hospitals using microdata from the CMS. The 'potential' was assessed using four indicators: population density, size of the hospital, specialization ratio, and for-profit status of the hospital. A principal component analysis of the indicators revealed a set of 13 hospitals that could adopt the REH status.

During 2010-2021, 136 rural hospitals closed due to financial difficulties. However, my analysis suggests that critical access hospitals have a cost-to-charge ratio of 18%-74%, not a dire financial situation (Appendix 1). It could be that customer attraction and retention are the problems; a topic for future research. Finally, this is an exploratory research, not a recommendation for hospitals to consider REH affiliation.

³⁰ Appendix 1 provides data on all hypotheses; I did not discuss them in-depth since the variables

in hypotheses 2 to 5 were used as indicators to construct the REH membership construct.

Appendix 1: Potential REH Members

Hospital	County	# of Services 2022	# of Service Changes in Services	Gross Revenue, 2022	Gross Revenue, 2019-2020	Ownership	CESA, LR	Pop. Density	Specialization Ratio
WARRIOR HOSPITAL AND HEALTH SERVICES	De Witt	21	22	31,700,250	24,400,290	7/2002/9	OR	26	0.287071223
WASHINGTON COUNTY HOSPITAL	Washington	19	0	21,150,139	20,020,500	46/00/1	OR	34.3	0.260778073
WHEATFIELD MEDICAL CENTER	Madison	23	0	38,136,644	38,000,280	61/11/11	OR	36.3	0.33366099
WINDY HILLS HOSPITAL	Madison	26	0	23,320,942	16,001,472	6/2000/05	OR	90.8	0.317760074
SART JEROME MEMORIAL	Jackson	29	3	21,770,920	24,010,020	2/9/2001	OR	15.8	0.320767129
SARAH D CULBERTSON	Schuyler	24	22	4,650,800	4,650,800	10/7/79	2 R	50.8	0.424007530
MASSAC MEMORIAL HOSPITAL	Madison	25	24	7,720,420	4,700,420	4/7/79	2 R	41.7	0.301360853
UNION COUNTY HOSPITAL DISTRICT	Union	22	22	26,413,380	17,440,200	8/6002/9	OR	81.4	0.336164384
MORRISON COMMUNITY HOSPITAL	Windsor	36	19	20,000,380	18,000,380	2/2002/3	OR	20.6	0.311700022
HARTEN COUNTY GENERAL HOSPITAL	Hartford	14	16	12,200,017	9,000,000	2/2002/3	OR	27.1	0.410090004
PARIS COMMUNITY HOSPITAL	Essex	30	19	12,200,017	9,000,000	2/2002/3	OR	27.1	0.410090004
ST. JOSEPH'S HOSPITAL	Madison	27	27	74,070,700	70,600,120	2/6/79/6	OR	26.4	0.290002014
CLAY COUNTY HOSPITAL	Clay	27	27	74,070,700	70,600,120	2/6/79/6	OR	26.4	0.290002014
MEAN		25	0	333,020,721	312,679,520	2/6/79/6	1	36.7	0.342400753
Little or No Potential for REH Membership									
CALDWELL AREA HOSPITAL	Madison	26	24	51,600,000	40,000,700	5/6/2003/2	OR	52.1	0.336164384
THE WASH BOND CRITICAL ACC HOSPITAL	Madison	11	25	16,017,114	17,050,950	4/79/1985	OR	22.1	0.336164384
ST. FRANCIS HOSPITAL	Madison	27	27	13,400,212	10,700,000	2/6/03/04	OR	40.2	0.300003014
ST. FRANCIS COMMUNITY HOSPITAL	Madison	32	34	7,020,200	5,120,000	10/7/80/27	OR	17.7	0.420002014
TAYLORVILLE MEMORIAL HOSPITAL	Christian	24	24	11,600,000	9,000,000	1/7/75/44	OR	48	0.320767129
ADVOCATE ERIEKA HOSPITAL	Windsor	28	28	3,800,000	2,900,000	1/8/75/44	OR	72.5	0.320767129
REDBUD GENERAL HOSPITAL	Hartford	22	22	13,270,180	10,000,000	2/75/46/07	2 R	55.4	0.301360853
MEMORIAL HOSPITAL ASSOCIATION	Hartford	29	24	5,200,000	4,000,000	6/2002/7	OR	22.2	0.337700024
ST. JOSEPH'S HOSPITAL	Essex	21	21	12,200,017	9,000,000	2/2002/3	OR	27.1	0.410090004
SPARTANBURG HOSPITAL	Hartford	24	24	61,400,000	50,000,000	1/2007/10	OR	32	0.280002014
SPRINGVILLE COMMUNITY HOSPITAL	Hartford	26	26	40,127,000	30,000,000	1/2007/10	OR	47.4	0.320767129
MEMORIAL HOSPITAL	Hartford	25	21	49,400,000	43,700,000	5/6/09/75	OR	52.4	0.342400753
NEKOTA COMMUNITY HOSPITAL	LaSalle	26	26	7,200,000	3,600,000	3/7/80/08	OR	31	0.320767129
CIST HOLY FAMILY MED CTR	Warren	28	24	70,000,000	60,711,520	9/2003/4	OR	50.0	0.424007530
HAMMOND-HENRY HOSPITAL	Warren	31	31	12,000,000	8,700,000	4/30/71/26	OR	62.0	0.424007530
FERRILL HOSPITAL	Warren	31	22	3,200,000	2,600,000	1/34/11/26	OR	62.0	0.424007530
ST. JOSEPH'S HOSPITAL	Warren	27	27	10,000,000	8,000,000	1/2007/10	OR	42.1	0.320767129
CHAMBERS MEMORIAL HOSPITAL	Warren	27	27	8,800,000	7,200,000	1/64/71/15	OR	42.1	0.320767129
BELLEVILLE HOSPITAL	Warren	27	27	5,200,000	4,100,000	1/2007/10	OR	40.2	0.320767129
OSF SAINT LUKE MEDICAL CENTER	Warren	24	26	87,000,000	76,710,000	1/3/09/26	OR	50.0	0.320767129
HAMILTON MEMORIAL HOSPITAL	Warren	26	24	32,000,000	30,700,000	1/4/03/06	OR	38.4	0.336164384
ABRAMHAM LINCOLN MEMORIAL HOSPITAL	Warren	42	42	14,414,670	11,400,000	2/6/02/42	OR	45.3	0.500041006
FARFELD MEMORIAL HOSPITAL	Wayne	21	21	90,127,000	79,001,211	1/11/40/150	OR	22.7	0.287071223
SALEM TOWNSHIP HOSPITAL	Wayne	28	18	850,000	700,000	2/7000/22	OR	65.0	0.320767129
ST. JOSEPH'S HOSPITAL	Wayne	31	31	11,000,000	10,000,000	1/2007/10	OR	82.6	0.336164384
ST. JOSEPH'S HOSPITAL	Wayne	23	23	1,400,000	1,000,000	4/2009/71	OR	82.6	0.336164384
ST. JOSEPH'S HOSPITAL	Wayne	27	27	10,000,000	9,000,000	1/2007/10	OR	37.1	0.336164384
PANA COMMUNITY HOSPITAL	Wayne	25	26	5,400,000	4,400,000	5/6/04/40	OR	48	0.342400753
PERY MEMORIAL HOSPITAL	Wayne	31	32	10,100,000	7,772,000	2/42/22/41	OR	30.3	0.424007530
GIBSON AREA HOSPITAL	Wayne	29	29	46,100,000	37,000,000	6/6002/9	OR	24.3	0.337700024
MASON DISTRICT HOSPITAL	Wayne	28	32	24,000,000	17,400,000	7/4/26/43	OR	27.0	0.337700024
VALLEY VIEW COMMUNITY HOSPITAL	Wayne	31	31	11,000,000	10,000,000	1/2007/10	OR	39.0	0.424007530
HARTFORD MEMORIAL HOSPITAL	Wayne	34	34	74,700,000	60,740,000	10/01/45	OR	35.4	0.480073429
HOPKINS MEMORIAL HOSPITAL	Wayne	26	24	5,000,000	4,200,000	1/67/02/09	OR	20.3	0.336164384
KIRBY HOSPITAL	Wayne	25	25	8,600,000	6,400,000	2/4002/09	OR	28	0.342400753
WABASH GENERAL HOSPITAL	Wabash	19	19	11,000,000	9,000,000	2/2002/3	OR	50.0	0.260778073
MEAN		27	0	794,414,15.0	613,800,56.5	1/2009/06.3	1	48	0.336164384